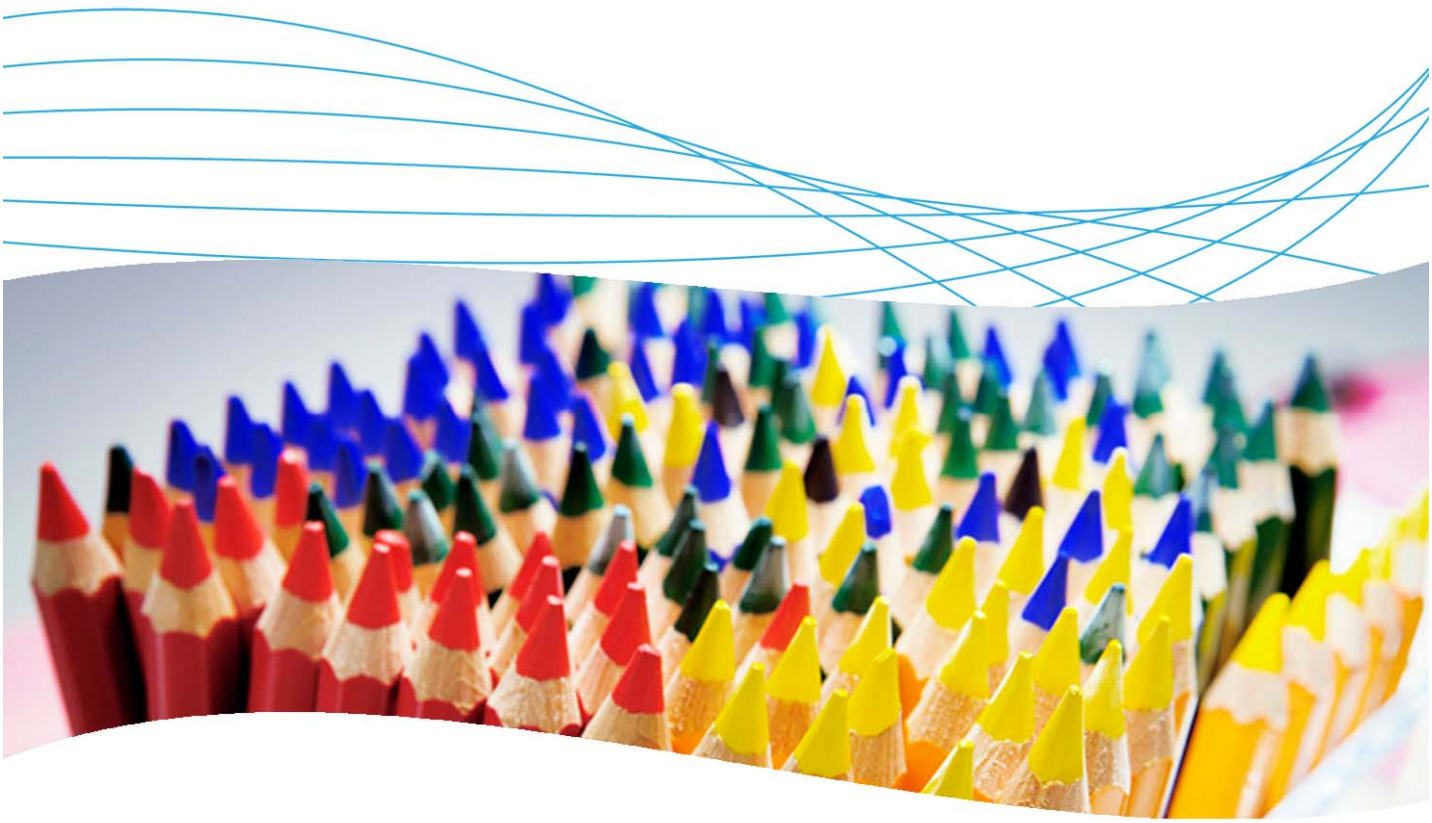
An HP ProCurve Networking Application Note

Interoperability between ProCurve WESM zl and Cisco Unified Wireless IP Phone 7921G



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1. Introduction

This document describes the interoperability of a ProCurve wireless services solution coupled with the Cisco Unified Wireless Phone 7921G to provide a secure Voice over WLAN (VoWLAN) solution with the following services:

- Secure wireless encryption with WPA/WPA2 (pre-shared key)
- Fast roaming
- Quality of Service (via WMM) on the wireless media
- Unscheduled Automated Power Save Delivery (UAPSD)

2. Prerequisites

You will need the following equipment:

- ProCurve Switch 5406zl or 8212zl with the latest firmware version
- Wireless Edge Services Module zl (WESM zl) plugged into a slot of the 5406zl
- Two ProCurve radio ports (RP210 or RP230)
- Cisco Unified Wireless IP Phone 7921G

The wireless services module and radio ports are installed in the 5406zl or 8212zl. The radio ports have been discovered.

For more information on this configuration please refer to ProCurve Application Note AN-M1, *How to extend your wired network to wireless*.

3. Network architecture

Figure 1 details the configuration referenced in this application note.

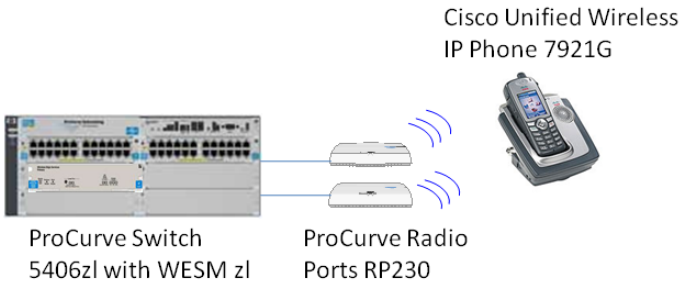


Figure 1. Configuration for ProCurve-Cisco wireless IP phone interoperability

4. Secure wireless WPA2-PSK encryption

The Cisco Unified Wireless IP Phone 7921G supports the following encryption options:

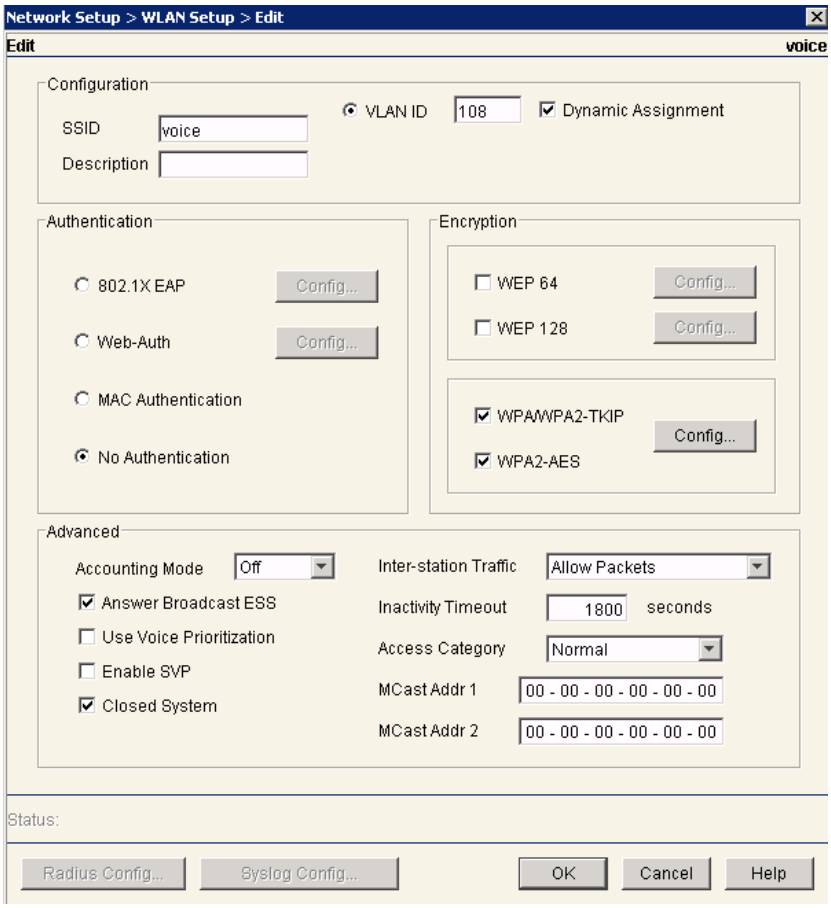
- WEP
- WPA1-PSK
- WPA2-PSK
- 802.1X with the following EAP protocols: LEAP, PEAP, EAP-FAST, EAP-TLS, and PEAP

This application note describes the configuration of WPA2-PSK encryption.

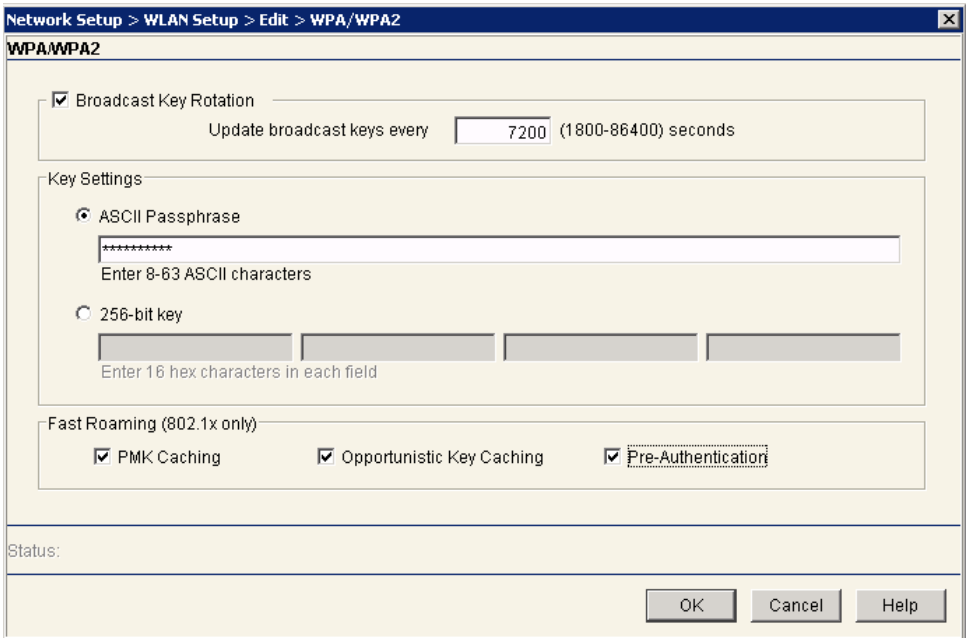
4.1 Configure the ProCurve WESM

To configure the ProCurve WESM for secure wireless encryption via WPA2-PSK:

1. On the wireless edge services module, go to Network Setup > WLAN Setup and create a new WLAN called voice.
2. Configure this WLAN as follows:
    - SSID: voice
    - VLAN ID: The VLAN you want to be assigned to the phone. This VLAN must be tagged on the WESM uplink from the switch menu. (For details, refer to Application Note AN-M1, or to the *Wireless Services Module Administrator Guide*).
    - Authentication: No Authentication.
    - Encryption: Enable both WPA/WPA2 TKIP and WPA2 AES.



3. Click the Config button, and configure the pre-shared key as follows.
    - ASCII passphrase: procurve
    - Enable all three Fast Roaming options (PMK Caching, Opportunistic Key Caching, Pre-Authentication).



4. Click OK to return to the main Edit window.
5. In the main Edit window, under Advanced, select Closed System, then click OK.
6. Finally, to enable the new WLAN, at the bottom of the WLAN list window click the Enable button.

4.2 Configure the Cisco wireless IP phone

To configure the Cisco Wireless IP Phone 7921G:

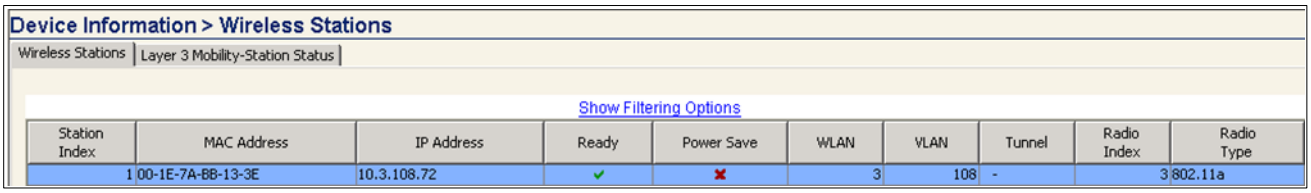
1. From the phone main menu, press the bottom arrow to enter the SETTINGS menu.
2. Then choose 2 for Network Profiles.
3. Select Profile 1 and press Change.
4. Press 1 to enter Profile Name. Enter a new profile name, WPA2. Then press Options and 1 to save the profile name.

   Note: If at any time you obtain the Settings locked message, press **# to unlock the screen.
5. Return to the Network Profiles menu and choose 2. Network Configuration.
6. If you want to assign a static IP address, set DHCP (option 4) to No, and assign the IP address, subnet mask and gateway.
   -or-
   Use DHCP with the following options:
    - Option 1: Subnet Mask
    - Option 3: Router IP Address
    - Option 6: DNS Server(s)
    - Option 15: DNS Domain Name
    - Option 66: TFTP Server
7. Press Options and 1 to save the network profile configuration.
8. Return to the Profile menu and choose 3. WLAN Configuration.

9. Set the WLAN parameters as follows:
    - 1. Ssid: voice
    - 2. Security Mode: Choose Auto (AKM)
    - 3. Leave unconfigured
    - 4. Leave unconfigured
    - 5. Key style: ASCII
    - 6. Pre-shared key: procurve
    - 7. 802.11 mode: Auto-RSSI

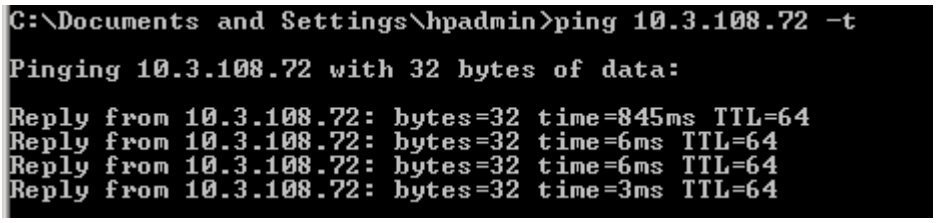
    Leave the other settings as they are.

10. On the WESM, you can now see the phone in Device Association > Wireless stations. You can see the phone's MAC Address, IP Address, WLAN, VLAN, and Radio Index:



    Note that the phone is now connected to the RP represented by Radio Index 3.

11. Check connectivity to the phone by running a ping to its IP address from another machine or other device on the same LAN:


C:\Documents and Settings\hpadmin>ping 10.3.108.72 -t
Pinging 10.3.108.72 with 32 bytes of data:
Reply from 10.3.108.72: bytes=32 time=845ms TTL=64
Reply from 10.3.108.72: bytes=32 time=6ms TTL=64
Reply from 10.3.108.72: bytes=32 time=6ms TTL=64
Reply from 10.3.108.72: bytes=32 time=3ms TTL=64

5. Fast roaming

Layer 2 roaming occurs when a phone that was associated to a radio port moves to another radio port adopted by the same WESM. The phone remains in the same VLAN.

Layer 3 roaming happens when a phone moves between two radio ports associated to different WESM modules. The voice WLAN is associated with different VLANs (and subnets) on the two modules. In this case, the phone keeps its originating IP address but the voice flow is tunneled by the current module to the home module.

For more information on L2/L3 roaming configurations, please refer to ProCurve Application Note AN-M3, *How to configure L2 and L3 wireless roaming*.

5.1 Fast roaming options

Normally, to enable a phone to transition faster between two radio ports and reduce the roaming time, you can configure these options:

- PMK caching
- Opportunistic key caching
- Pre-authentication

These options apply to 802.1X authentication only, which is supported with EAP-TLS on the Cisco phone. This application note, however, presents authentication with WPA2.

5.2 Configure self-healing

The self-healing feature enables associating neighbors to each radio port. In case of failure of a radio port, the neighbors increase their transmit power to provide coverage and compensate for the failed RP. You can also enable interference avoidance, which causes radios to change their channel settings to avoid interfering with surrounding radios.

To enable self-healing:

1. From the Special Features > Self Healing > Configuration tab, check the Enable Neighbor Recovery box, then click Apply.

2. Then from the Neighbor Details tab click Detect Neighbors.
3. You can now edit an RP radio to check that the other radios with same 802.11 mode (a or b/g) have been listed as neighbors.

Radio Index	Description	Type	RP Ethernet MAC	Action	Neighbor Radio Indices
1	RADIO1	802.11bg	00-14-C2-A0-6B-D0	Both	2,4
2	RADIO2	802.11bg	00-17-A4-98-6F-0B	Both	1,4
3	RADIO3	802.11a	00-17-A4-98-6F-0B	Both	6
4	RADIO4	802.11bg	00-17-A4-98-6F-57	Both	1,2
5	RADIO5	802.11a	00-17-A4-98-6F-57	Both	None
6	RADIO6	802.11a	00-14-C2-A0-6B-D0	Both	3

5.3 Test roaming time

You can determine the roaming time by first using the WESM to determine the radio port to which the phone is associated. To test roaming time:

1. From Device Association > Wireless Stations, note the radio's Station Index.
2. Go to Device Association > Radio Adoption Statistics and determine the MAC address of the corresponding radio port.
3. To determine the switch port associated with this MAC address, use ProCurve Manager's Find Node tool.
    - Use the command show lldp info remote all on the switch if the radio ports are connected at layer 2.
    - Or use show arp if the radio ports have IP addresses.
4. From a machine on the network launch a ping to the phone IP address: 10.1.40.151.
5. From the switch CLI or Web agent disable the port of the RP to which the phone is associated. The phone should lose one or two pings, then subsequent pings should be successful again:

```
Reply from 10.3.108.72: bytes=32 time=6ms TTL=64
Reply from 10.3.108.72: bytes=32 time=6ms TTL=64
Reply from 10.3.108.72: bytes=32 time=3ms TTL=64
Reply from 10.3.108.72: bytes=32 time=3ms TTL=64
Request timed out.
Request timed out.
Request timed out.
Reply from 10.3.108.72: bytes=32 time=3ms TTL=64
Reply from 10.3.108.72: bytes=32 time=3ms TTL=64
Reply from 10.3.108.72: bytes=32 time=4ms TTL=64
Reply from 10.3.108.72: bytes=32 time=3ms TTL=64
```

After losing between 1 and 3 pings, you see the phone associated to another radio. In this case, the Radio Index, which was previously 3, is now 5, indicating the phone is now associated with the RP represented by Radio Index 5:

Station Index	MAC Address	IP Address	Ready	Power Save	WLAN	VLAN	Tunnel	Radio Index
1	00-1E-7A-BB-13-3E	10.3.108.72	✔	✔	3	108	-	5

6. Configuring 802.11e and UAPSD

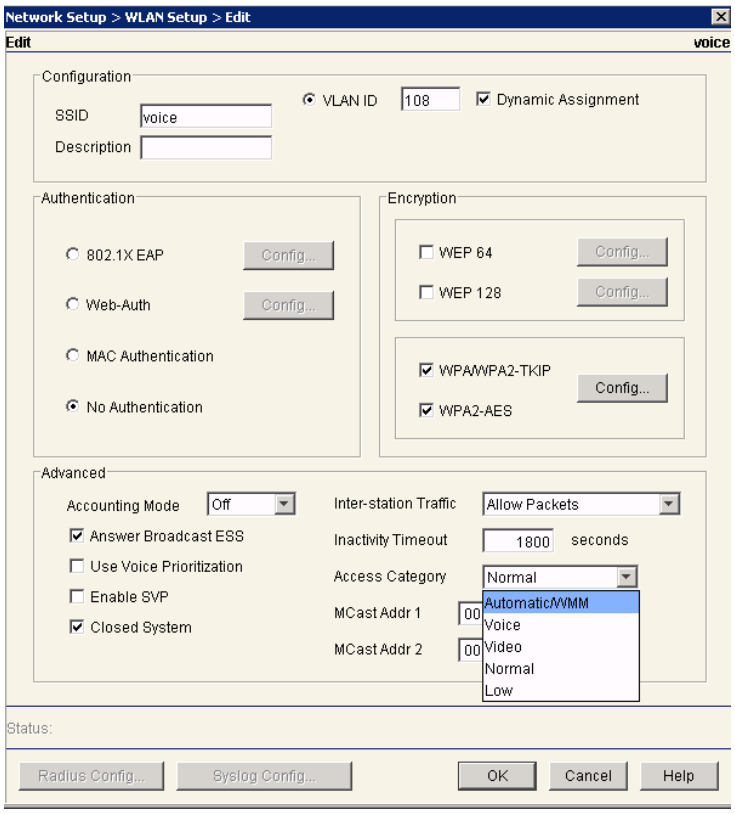
This section details how to configure WMM (802.11e) and Unscheduled Automatic Power Save Delivery (UAPSD).

6.1 Configure WMM on the WESM

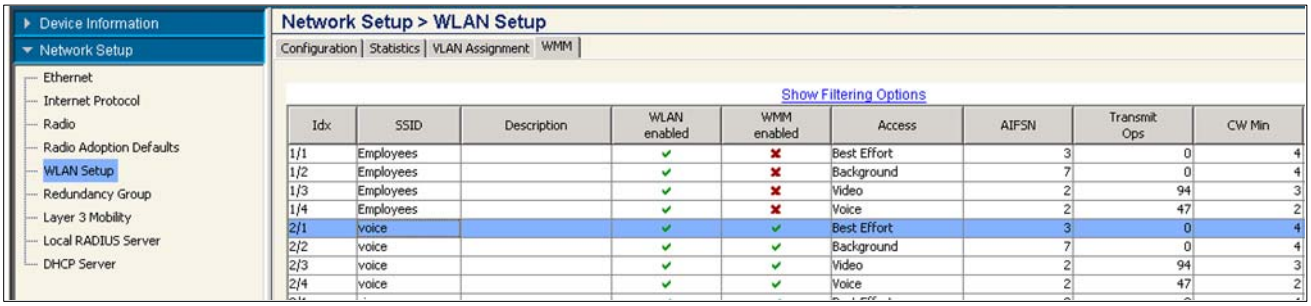
To prioritize voice traffic you can configure WiFi Multimedia (WMM), which is a WiFi Alliance interoperability certification based on the 802.11e standard. WMM automatically defines four classes of traffic that will be queued and prioritized accordingly.

To configure WMM on the Wireless Edge Services Module:

1. Edit the voice WLAN.
2. In Advanced Parameters, set the Access Category to Automatic WMM.
3. In Network Setup > WLAN Setup > Edit screen, go to the WMM tab and verify that the voice VLAN is configured for WMM with four queues: Voice, Video, Background and Best Effort.
4. If desired, you can modify the parameters of these different classes of traffic:
   - AIFSN
   - Transmit Ops
   - CW Minimum
   - CW Maximum
   - Use DSCP or 802.1p priority (DSCP by default)



5. Click OK to accept Automatic/WMM as the Access Category. Wireless traffic is placed in the four queues according to its 802.1p priority (default) or DSCP value.



Idx	SSID	Description	WLAN enabled	WMM enabled	Access	AIFSN	Transmit Ops	CW Min
1/1	Employees		✔	✖	Best Effort	3	0	4
1/2	Employees		✔	✖	Background	7	0	4
1/3	Employees		✔	✖	Video	2	94	3
1/4	Employees		✔	✖	Voice	2	47	2
2/1	voice		✔	✔	Best Effort	3	0	4
2/2	voice		✔	✔	Background	7	0	4
2/3	voice		✔	✔	Video	2	94	3
2/4	voice		✔	✔	Voice	2	47	2

Note that for each queue, four parameters are defined:

- AIFSN, Arbitration IFS Number, the default time before countdown.
- CW minimum (CWmin), the minimum contention window.
- CW maximum (CWmax), the maximum contention window.
- Transmit Ops (TXOP), the opportunity to transmit. This is the time during which a station that has won the control of the shared medium can retain it.

For more information on WMM configuration on the WESM, please refer to ProCurve Application Note AN-M12, *Using 802.11e and WMM on the ProCurve Wireless Edge Services Module*.

6.2 Configure UAPSD on the Cisco wireless IP phone

UAPSD (Unscheduled Automatic Power Save Delivery) has been adopted by the WiFi Alliance, where it is known as WMM Power Save. This technology allows saving battery power and fine-tuning the power consumption of wireless stations on WMM-enabled wireless networks.

To configure the Cisco wireless phone for UAPSD:

1. From the Settings Menu, open Network Profiles.
2. Edit the Network Profile you want to modify, using the Change button.
3. Choose 3. WLAN Configuration.
4. Choose 9. Call Power Save Mode.
5. Choose 1. U-APSD/PS-Poll and then Save.
6. Click Back several times to exit the different menus.

7. Firmware versions

Firmware versions of the switches used for this application note are as follows:

- K.13.09 for the ProCurve Switch 5406zl
- WT.01.15 for the ProCurve WESM zl

- Cisco Unified Wireless IP Phone 7921G firmware: Version 1.1.1 (`cmterm-7921-sccp.1-1-1.exe`)

Upgrading firmware in the Cisco wireless IP phone: Download the `cmterm` file to Cisco Call Manager version 4.1 or later, and open it to upgrade the CCM. (You need a CCO login to download the firmware version.)

8. Reference documents

This concludes the procedures for interoperating ProCurve switches with the Cisco Unified Wireless IP Phone 7921G.

For further information about how to configure ProCurve switches to support mobility, please refer to the following links:

- For user manuals for ProCurve 3500yl-5400zl-8212zl switches:
  http://www.hp.com/rnd/support/manuals/3500-6200-5400-ChapterFiles.htm
- For ProCurve WESM zl manuals:
  http://www.hp.com/rnd/support/manuals/wireless_zl.htm
- For PCM+ and IDM manuals:
  http://www.hp.com/rnd/support/manuals/ProCurve-Manager.htm
  http://www.hp.com/rnd/support/manuals/IDM.htm
- For the *Administration Guide* for the Cisco Unified Wireless IP Phone 7921G:
  http://www.cisco.com/en/US/docs/voice_ip_comm/cuipph/7921g/6_0/english/administration/guide/21adm60.html

For further information, please visit www.procurve.eu

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